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10/091,821	03/06/2002	Gerhard Beckmann	107044-0016	8484

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EXAMINER	
LEWIS, BEN	

ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/091,821	BECKMANN ET AL.	
	Examiner	Art Unit	
	Ben Lewis	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *38-45, 51 and 54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *51 and 54* is/are allowed.

6)☒ Claim(s) *38-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 March 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. The Applicant's amendment filed on October 15th, 2007 was received. Claims 38, 45, 51 and 54 were amended. Claims 1-37, 46-50, 52, 53 and 55 were cancelled.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action (issued on June 14th, 2007).

Claim Rejections - 35 USC § 112

3. The claim rejections under 35 U.S.C. 112, first paragraph, on claims 51 and 54 are withdrawn, because the applicant's arguments are persuasive. .

4. The claim rejections under 35 U.S.C. 112, second paragraph, on claim 41 is withdrawn, because applicant's arguments are persuasive.

Claim Rejections - 35 USC § 103

5. Claims 38-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson et al. (U.S. Patent No. 6,682,839 B2) in view of Nakamura (Japanese Patent No. JP356114284A) and further in view of Crawford, Sr. et al. (U.S. Patent No. 5,629,104).

With respect to claims 38 and 39, Wilkinson et al teach that fuel cell stack **10** is depicted schematically, showing various layers of the stack without showing the housing, internal manifolds, or sealing mechanisms which prevent intermixing of reactants. FIG. 1 illustrates the stacked electrochemically active layers of three electrochemical fuel cell assemblies. In particular, for each fuel cell assembly, these layers are the electrolyte **20**, a cathode **22**, and an anode **24**, all disposed between a pair of flow field plates, which are also known as separator plates **26**. A single separator plate **26** may be shared between two adjacent fuel cell assemblies. The electrochemically active area of the fuel cells is defined by a cathode electrocatalyst **28** disposed at an interface between electrolyte **20** and cathode **22** and an anode electrocatalyst **30** disposed at an interface between electrolyte **20** and anode **24**. In a preferred embodiment, electrolyte layer **20** comprises an ion exchange membrane. Oxidant supply subsystem **32** and heat transfer liquid supply subsystem **42**, supply an oxidant fluid stream comprising an oxidant and a heat transfer liquid to oxidant supply manifold **34**. Oxidant supply manifold **34** is shown as an external manifold for illustrative purposes, but an internal manifold passing through the thickness of the layers of fuel cell stack **10** is also a preferred embodiment. Oxidant supply manifold 34 directs the oxidant fluid stream to oxidant fluid passages of each of the individual fuel cell assemblies (Col 8 lines 39-67). Fuel supply subsystem **38** supplies a fuel stream to fuel supply manifold **40**. Fuel supply manifold **40** is shown as an external manifold for illustrative purposes, but an internal fuel supply manifold is also a preferred embodiment. Fuel supply manifold **40** directs the fuel stream to fuel fluid passages and

anode electrocatalyst **30** of each of the individual fuel cell assemblies. The fuel stream may be exhausted from stack **10**, recirculated, or dead-ended, depending on the fuel and the desired mode of operation. However, even for dead-ended operation, an exhaust manifold **39** is typically provided so that the fuel fluid passages may be periodically purged by opening a purge valve (not shown in FIG. 1) which is closed during dead-ended operation. Valve **41** may be used to shut off the fuel supply stream and/or to regulate the amount of fuel supplied to fuel cell stack **10**. (Col 9 lines 30-55).

Wilkinson et al. also teach that the fuel fluid stream which is supplied to the anode may be a gas such as substantially pure hydrogen or a reformate stream comprising hydrogen. Alternatively, a liquid fuel stream such as, for example, aqueous methanol may be used (Col 2 lines 1-5).

With regard to air and fuel being introduced into said anode chamber Wilkinson et al does not specifically teach allowing introduction of air into said anode chamber. However, Nakamura disclose a device for starting methanol fuel cells wherein, the surface of the fuel electrode is subjected to catalytic burning to shorten the warming-up time of the fuel cell by providing an air bypath and supplying fuel added with air to the surface of the fuel electrode (See Abstract). Nakamura also teach that air is supplied from a blower **17** through an air path **16** into an air chamber **5**, which is adjacent to the air-electrode side chamber **12** with the support **7** placed between them. The air path **16** is connected to a fuel path **13** by means of a bypath **18**. In starting the battery "fuel cell" operation, a fuel-supplying pump **15** is driven and a bypath valve **19** is opened, before air and methanol as a fuel are supplied into the fuel-electrode side chamber **11** (See

abstract). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feeding of air with fuel into the anode chamber of Nakamura into the fuel cell of Wilkinson because Nakamura teach that introduction of fuel and air into the anode chamber shortens the warming-up time of the fuel cell (See abstract).

With respect to air and fuel inlets to the anode chamber being separate first and second openings. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the integral fuel and air inlet ports to the anode chamber of Nakamura separate fuel and air inlet ports to the anode chamber because making separable components integral is a matter of obvious engineering choice. In re Larson, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. The court affirmed the rejection holding, among other reasons, "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice.").

With respect to the use of pure methanol. Wilkinson et al. as modified by Nakamura do not specifically teach that the methanol used is pure. However, Crawford, Sr. et al. disclose a methanol fuel cell wherein The system 10 includes a tank 12 which stores pure methanol and a tank 14 which stores pure water. These two tanks are combined via a pump and valve system into a three percent methanol water solution.

The methanol water solution is then pumped into a filter which is placed within the modular energy device 16. The modular energy device 16 also includes a trough for the oxidant (air) to be supplied to the cathode side of the modular energy device (Col 3 lines 25-55). Therefore it would have been obvious to one of ordinary skill in the art to use pure methanol of Crawford Sr. et al. in the fuel tank of Wilkinson et al. as modified by Nakamura because a system with pure methanol in the fuel tank has greater fuel capacity as opposed to a system having diluted methanol in the fuel tank.

Examiner notes that, similar to the prior art, applicants fuel cell system dilutes pure methanol before the methanol enters the fuel chamber of applicant's fuel cell system

With respect to claims 40 and 42, Wilkinson et al teach that valve **6** may be used to shut off the oxidant supply stream and/or to control the amount of oxidant supplied to fuel cell stack **10**. Oxidant supply subsystem **32** typically comprises a purification unit and a blower or compressor. The purification unit may comprise, for example, filters for removing particulate contaminants from air, which may be the source of the oxidant supply stream. In some applications, such as space vehicles or submarines, the oxidant may be supplied from a pressure vessel that contains air or substantially pure oxygen under pressure (Col 9 lines 4-15). With respect to a load connected across the

fuel cell such that the system functions in an electricity generating mode Wilkinson et al teach that to improve the viability of fuel cells as a commercial power source, it is generally desirable to improve the power density of the stack, that is, to reduce the stack dimensions and weight for a given electrical power output capability (Col 1 lines 55-65). Therefore the fuel cell of Wilkinson et al is used to supply power to a load.

With respect to claim 41, Wilkinson et al teach that Fuel supply subsystem **38** supplies a fuel stream to fuel supply manifold **40**. Fuel supply manifold **40** is shown as an external manifold for illustrative purposes, but an internal fuel supply manifold is also a preferred embodiment. Fuel supply manifold **40** directs the fuel stream to fuel fluid passages and anode electrocatalyst **30** of each of the individual fuel cell assemblies. The fuel stream may be exhausted from stack **10**, recirculated, or dead-ended, depending on the fuel and the desired mode of operation. However, even for dead-ended operation, an exhaust manifold **39** is typically provided so that the fuel fluid passages may be periodically purged by opening a purge valve (not shown in FIG. 1) which is closed during dead-ended operation. Valve **41** may be used to shut off the fuel supply stream and/or to regulate the amount of fuel supplied to fuel cell stack **10**. (Col 9 lines 30-55).

With respect to claim 43, Wilkinson et al teach that valve **6** may be used to shut off the oxidant supply stream and/or to control the amount of oxidant supplied to fuel cell stack **10**. Oxidant supply subsystem **32** typically comprises a purification unit and a blower or compressor. The purification unit may comprise, for example, filters for removing particulate contaminants from air, which may be the source of the oxidant supply stream. In some applications, such as space vehicles or submarines, the oxidant may be supplied from a pressure vessel that contains air or substantially pure oxygen under pressure (Col 9 lines 4-15). The instant specification recites: "said water generator/DMFC 61 can be used to generate water by: 1) introducing excess fuel (in proportion to the demand of the attached load) to a DMFC of standard design and materials; or 2) introducing fuel to a to water generator/DMFC 61t without a load being connected between the anode and cathode aspects of the water generator/DMFC 61. By doing so, fuel crossover is promoted, and fuel that passes through the PCM is oxidized without generating electricity, thus forming additional water in the cathode chamber 67 of the water generator/DMFC 61. It may be further possible to intentionally vary said load attached to water generator/DMFC 61 periodically in order to periodically induce fuel crossover, and resulting generation of water" (Paragraph 0041).

Wilkinson et al do not specifically teach a load is uncoupled and not connected across the fuel cell such that there is fuel crossover and the system functions in a water genenrationg mode at the cathode chamber. However, it is the position of the examiner that such properties as fuel crossover and water generation at the cathode chamber of a direct methanol fuel cell are inherent, given that Wilkinson et al and the present

application utilize a direct methanol fuel cell with air and fuel being fed to the anode. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. In re Robertson, 49 USPQ2d 1949 (1999).

6. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson et al. (U.S. Patent No. 6,682,839 B2) in view of Nakamura (Japanese Patent No. JP356114284A) and Crawford, Sr. et al. (U.S. Patent No. 5,629,104). and further in view of Tillmetz et al. (U.S. Patent No. 6,410,175 B1).

With respect to claim 45, Wilkinson et al. teach that fuel cell stack **10** is depicted schematically, showing various layers of the stack without showing the housing, internal manifolds, or sealing mechanisms which prevent intermixing of reactants. FIG. 1 illustrates the stacked electrochemically active layers of three electrochemical fuel cell assemblies. In particular, for each fuel cell assembly, these layers are the electrolyte **20**, a cathode **22**, and an anode **24**, all disposed between a pair of flow field plates, which are also known as separator plates **26**. A single separator plate **26** may be shared between two adjacent fuel cell assemblies. The electrochemically active area of the fuel cells is defined by a cathode electrocatalyst **28** disposed at an interface between electrolyte **20** and cathode **22** and an anode electrocatalyst **30** disposed at an interface between electrolyte **20** and anode **24**. In a preferred embodiment, electrolyte

layer **20** comprises an ion exchange membrane. Oxidant supply subsystem **32** and heat transfer liquid supply subsystem **42**, supply an oxidant fluid stream comprising an oxidant and a heat transfer liquid to oxidant supply manifold **34**. Oxidant supply manifold **34** is shown as an external manifold for illustrative purposes, but an internal manifold passing through the thickness of the layers of fuel cell stack **10** is also a preferred embodiment. Oxidant supply manifold 34 directs the oxidant fluid stream to oxidant fluid passages of each of the individual fuel cell assemblies (Col 8 lines 39-67). Fuel supply subsystem **38** supplies a fuel stream to fuel supply manifold **40**. Fuel supply manifold **40** is shown as an external manifold for illustrative purposes, but an internal fuel supply manifold is also a preferred embodiment. Fuel supply manifold **40** directs the fuel stream to fuel fluid passages and anode electrocatalyst **30** of each of the individual fuel cell assemblies. The fuel stream may be exhausted from stack **10**, recirculated, or dead-ended, depending on the fuel and the desired mode of operation. However, even for dead-ended operation, an exhaust manifold **39** is typically provided so that the fuel fluid passages may be periodically purged by opening a purge valve (not shown in FIG. 1) which is closed during dead-ended operation. Valve **41** may be used to shut off the fuel supply stream and/or to regulate the amount of fuel supplied to fuel cell stack **10**. (Col 9 lines 30-55).

Wilkinson et al. also teach that the fuel fluid stream which is supplied to the anode may be a gas such as substantially pure hydrogen or a reformate stream comprising hydrogen. Alternatively, a liquid fuel stream such as, for example, aqueous methanol may be used (Col 2 lines 1-5).

With regard to air and fuel being introduced into said anode chamber Wilkinson et al. does not specifically teach allowing introduction of air into said anode chamber. However, Nakamura disclose a device for starting methanol fuel cells wherein, the surface of the fuel electrode is subjected to catalytic burning to shorten the warming-up time of the fuel cell by providing an air bypath and supplying fuel added with air to the surface of the fuel electrode (See Abstract). Nakamura also teach that air is supplied from a blower **17** through an air path **16** into an air chamber **5**, which is adjacent to the air-electrode side chamber **12** with the support **7** placed between them. The air path **16** is connected to a fuel path **13** by means of a bypath **18**. In starting the battery "fuel cell" operation, a fuel-supplying pump **15** is driven and a bypath valve **19** is opened, before air and methanol as a fuel are supplied into the fuel-electrode side chamber **11** (See abstract). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feeding of air with fuel into the anode chamber of Nakamura into the fuel cell of Wilkinson because Nakamura teach that introduction of fuel and air into the anode chamber shortens the warming-up time of the fuel cell (See abstract).

With respect to air and fuel inlets to the anode chamber being separate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the integral fuel and air inlet ports to the anode chamber of Nakamura separate fuel and air inlet ports to the anode chamber because making separable components integral is a matter of obvious engineering choice. In re Larson, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as

obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. The court affirmed the rejection holding, among other reasons, "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice."); but see Schenck v.

With respect to the use of pure methanol. Wilkinson et al. as modified by Nakamura do not specifically teach that the methanol used is pure. However, Crawford, Sr. et al. disclose a methanol fuel cell wherein The system 10 includes a tank 12 which stores pure methanol and a tank 14 which stores pure water. These two tanks are combined via a pump and valve system into a three percent methanol water solution. The methanol water solution is then pumped into a filter which is placed within the modular energy device 16. The modular energy device 16 also includes a trough for the oxidant (air) to be supplied to the cathode side of the modular energy device (Col 3 lines 25-55). Therefore it would have been obvious to one of ordinary skill in the art to use pure methanol of Crawford Sr. et al. in the fuel tank of Wilkinson et al. as modified by Nakamura because a system with pure methanol in the fuel tank has greater fuel capacity as opposed to a system having diluted methanol in the fuel tank.

Examiner notes that, similar to the prior art, applicants fuel cell system dilutes pure methanol before the methanol enters the fuel chamber of applicant's fuel cell system

Wilkinson et al as modified by Nakamura and Crawford, Sr. et al. do not specifically teach coupling to a second fuel cell to deliver water to the anode of said second fuel cell. However, Tillmetz et al discloses a fuel cell system with improved starting capability wherein, FIG. 3 shows another embodiment of a fuel cell system **30** which also includes first and second fuel cell stacks **21**, **22**, a fuel processing subsystem **29** comprising a reformer **23**, and a methanol reservoir **24**, each of which is similar in construction and operation to those shown in FIG. 2. However, a starting fluid reservoir **26** comprising a supply of starting fluid is included and a different procedure may be followed with regards to water reservoir **25**. In FIG. 3, during start-up, a starting fluid is provided directly from starting fluid reservoir **26** through valve **28a** to fuel inlet **21a** of the first fuel cell stack **21**. Feedstock for the reformer is provided by the controlled mixing of methanol from methanol reservoir **24** and water from water reservoir **25** at junction **27b**. Again, the feedstock is directed to reformer inlet **23a**. Here, a supply of water for the water reservoir **25** is obtained from the product water generated by the operating first and/or second fuel cell stacks **21**, **22**. Thus, water from first stack outlet **21b** and second stack outlet **22b** is collected and directed into water reservoir **25**. At system shutdown, the water reservoir **25** may be emptied so as to avoid freezing. In this embodiment, it may be possible to rely on the production of water from the first stack **21** during start-up to prepare a sufficient amount of aqueous feedstock for the reformer, after which production of water is used from both stacks **21**, **22** after start-up (Col 6 lines 55-67); (Col 7 lines 1-20). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the water from the first stack into

the second stack of Tillmetz et al into the fuel cell system of Wilkinson et al as modified by Nakamura and Crawford, Sr. et al. because Tillmetz et al teach that it may be possible to rely on the production of water from the first stack **21** during start-up to prepare a sufficient amount of aqueous feedstock for the reformer, after which production of water is used from both stacks **21**, **22** after start-up (Col 7 lines 1-20)

7. Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson et al. (U.S. Patent No. 6,682,839 B2), Nakamura (Japanese Patent No. JP356114284A) and Crawford, Sr. et al. (U.S. Patent No. 5,629,104).as applied to claim 43 above and further in view of Grasso et al. (U.S. Patent No. 6,475,652 B1).

With respect to claim 44, Wilkinson et al as modified by Nakamura and Crawford, Sr. et al. teach that fuel cell stack in paragraph 17 above. Wilkinson et al as modified by Nakamura and Crawford, Sr. et al. do not specifically teach the system further comprising a load being a variable load that can be used to periodically induce fuel crossover, resulting in generation of water. However, Grasso et al. teach a fuel cell power plant wherein in operation of PEM fuel cells, it is critical that a proper water balance be maintained between a rate at which water is produced at the cathode electrode including water resulting from proton drag through the PEM electrolyte and rates at which water is removed from the cathode and at which water is supplied to the anode electrode. An operational limit on performance of a fuel cell is defined by an ability of the cell to maintain the water balance as electrical current drawn from the cell into the external load circuit varies and as an operating environment of the cell varies.

For PEM fuel cells, if insufficient water is returned to the anode electrode, adjacent portions of the PEM electrolyte dry out thereby decreasing the rate at which hydrogen ions may be transferred through the PEM and also resulting in cross-over of the reducing fluid leading to local over heating. Similarly, if insufficient water is removed from the cathode, the cathode electrode may become flooded effectively limiting oxidant supply to the cathode and hence decreasing current flow. Additionally, if too much water is removed from the cathode, the PEM may dry out limiting ability of hydrogen ions to pass through the PEM, thus decreasing cell performance (Col 1 lines 60-67);(Col 2 lines 1-20). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the varying of an external load of Grasso et al in to the fuel cell system of Wilkinson et al as modified by Nakamura and Crawford, Sr. et al. because Grasso et al teach that an operational limit on performance of a fuel cell is defined by an ability of the cell to maintain the water balance as electrical current drawn from the cell into the external load circuit varies and as an operating environment of the cell varies. For PEM fuel cells, if insufficient water is returned to the anode electrode, adjacent portions of the PEM electrolyte dry out thereby decreasing the rate at which hydrogen ions may be transferred through the PEM and also resulting in cross-over of the reducing fluid leading to local over heating (Col 1 lines 60-67).

Allowable Subject Matter

Claims 51 and 54 are allowed.

The prior art does not teach or suggest a fuel cell including all of the claimed features. The most pertinent art includes Wilkinson et al. (U.S. Patent No. 6,682,839 B2) and Nakamura (Japanese Patent No. JP356114284A)

Both Wilkinson et al. and Nakamura do not teach or suggest detachably connecting a load across said membrane electrode assembly; and introducing fuel and oxygen into said anode chamber to oxidize said fuel to produce water, and detaching said load such that the system produces no electricity as claimed by applicant in claim 51.

Response to Arguments

8. Applicant's arguments filed on October 15th, 2007 have been fully considered but they are not persuasive.

Applicant's principal arguments are

(a) Applicant's system creates water from the pure methanol to allow for a smaller device then using diluted methanol. In contrast neither Wilkinson nor Nakamura disclose using pure methanol. Wilkinson discloses using aqueous methanol or 33% methanol. Nakamura does not disclose what concentration of methanol but because the water is discharged externally then it is not necessary to use pure methanol. Furthermore, Nakamura discloses that a catalytic combustion at the surface of the

anode creates heat, and not that the fuel is oxidized to create water. Nakamura wants to use the extra electrons to create heat on the electrode, where Applicant's goal is to create water for use in the anode cathode reaction.

Accordingly, Applicant respectfully urges that Wilkinson and Nakamura, taken alone or in combination, are legally insufficient to make obvious the presently claimed invention under 35 U.S.C. § 103 because of the absence of the Applicant's claimed novel a source of fuel in fluid communication with said housing, wherein the fuel is substantially composed of pure methanols..., a plurality of openings, a first opening being an air inlet allowing air introduction into said anode chamber, and a second opening being a separate fuel inlet allowing introduction of fuel into said anode chamber, such that when air and fuel are introduced into said anode chamber, fuel is oxidized on said anode aspect into water and carbon dioxide, said anode chamber further including an opening through which carbon dioxide exits.

(b) With respect to Tillmetz, the Tillmetz reference also relates to reformer-based hydrogen fuel cells that require a reformer, not taught by Applicant. Applicant's invention relates to direct methanol fuel cells that do not require a reformer. Furthermore, though Tillmetz teaches two fuel cell stacks and mentions that "product" water can be used, this product water (as found inherent by the Examiner) would be produced on the cathode side of the fuel cell. Tillmetz contains no teaching that fuel and oxygen be reacted on the anode side into water and this water so generated is supplied to a second direct oxidation fuel cell. Tillmetz uses the methanol fuel on start up to produce a hydrogen gas fuel stream that is supplied to a different hydrogen fuel cell stack. Tillmetz does not

teach generating water at an anode side of a first fuel cell and supplying this water to a second fuel cell in the manner claimed by Applicant. Accordingly, claim 45 is believed allowable in view of the above arguments.

In response to Applicant's arguments, please consider the following comments.

(a) With respect to the use of pure methanol. Wilkinson et al. as modified by Nakamura do not specifically teach that the methanol used is pure. However, Crawford, Sr. et al. disclose a methanol fuel cell wherein The system 10 includes a tank 12 which stores pure methanol and a tank 14 which stores pure water. These two tanks are combined via a pump and valve system into a three percent methanol water solution. The methanol water solution is then pumped into a filter which is placed within the modular energy device 16. The modular energy device 16 also includes a trough for the oxidant (air) to be supplied to the cathode side of the modular energy device (Col 3 lines 25-55). Therefore it would have been obvious to one of ordinary skill in the art to use pure methanol of Crawford Sr. et al. in the fuel tank of Wilkinson et al. as modified by Nakamura because a system with pure methanol in the fuel tank has greater fuel capacity as opposed to a system having diluted methanol in the fuel tank.

Examiner notes that, similar to the prior art, applicants fuel cell system dilutes pure methanol before the methanol enters the fuel chamber of applicant's fuel cell system

(b) Tillmetz et al teach that it may be possible to rely on the production of water from the first stack **21** during start-up to prepare a sufficient amount of aqueous feedstock for the reformer, after which production of water is used from both stacks **21**, **22** after start-up (Col 7 lines 1-20)

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Ben Lewis

Patent Examiner
Art Unit 1795

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795